Little Bright Box: Using Interactive Games as a Tool to Boost Literacy Skills in Early Childhood

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.903SEDU0300

Received: 22 May 2025; Accepted: 26 May 2025; Published: 28 June 2025

ABSTRACT

Early childhood literacy is crucial for sustained academic achievement; however, educators still encounter difficulties in fostering these skills in early learners. Previous studies highlighted the significance of early literacy, but there remains room for further discovery and learning. This study explored how interactive games can support literacy development in early childhood, especially given the limited research on their long-term impact. To address this, the researchers created the Little Bright Box, a tool aimed at improving letter recognition, writing, and basic reading skills. Using a mixed methods approach with an exploratory sequential design, qualitative data were collected through focus group discussions and interviews with kindergarten teachers and pre-service teachers; meanwhile the researchers conducted quantitative evaluations using rating sheets and surveys. The findings revealed that students exhibited greater engagement, motivation, and improvement in literacy skills when exposed to Little Bright Box interactive games compared to traditional methods of teaching and learning. The study underscores that interactive games like the Little Bright Box can be valuable tools in early literacy instruction. It highlights the importance of integrating such methods into early education and encourages continued research on the development of similar educational games.

Keywords: interactive games, literacy skills, early childhood, little bright box.

INTRODUCTION

The world is evolving rapidly with technological advancements; however, a persistent issue remains: global literacy. According to UNESCO (2025), over 754 million adults and two hundred fifty million children lack the basic literacy skills. Several factors contributed to the crisis, with poverty being one of the most prevalent barriers. In South Sudan, the world's poorest country, over 70% of adults are illiterate, and 2.8 million children remain out of school (UNICEF, 2019). Beyond economic challenges, issues such as learning disabilities, cultural issues, limited book access, and inadequate resources hinder literacy.

The COVID-19 pandemic has led to significant educational disruptions for children and youths worldwide, resulting in the loss of education. This has led to significant consequences, including an estimated 70% of 10-year-old children in low-income and middle-income countries being unable to read a simple text. (Burki, 2022)

Interactive games, whether on-screen or off-screen, are innovative approaches that show promise for growing literacy skills in early childhood. Research supports using play-based learning to motivate and engage young learners. Research supports using play-based learning to motivate and engage young learners. Research claims that interactive games improve early reading skills (Marchumah et al., 2023), stimulate language development through peer interactions (Naderi & Moafian, 2023), and resulted in enhance engagement, skill acquisition, and knowledge retention**.** (Mammadova, 2024) Furthermore, the MATATAG Curriculum (DepEd, 2024) emphasizes a play approach, highlighting the need for early childhood education Little Bright Box by Integrating Direct Classroom Perspectives with Interactive learning.

While the advantages exist, there are numerous challenges to consider: from the teachers' perspective, some may be apprehensive or hesitant to use interactive games as a way of teaching because, according to (Toda et al., 2024) social acceptance among peers and students also plays a crucial role; teachers may fear negative perceptions or resistance from others regarding the use of games in education. Furthermore, Teachers may also feel apprehensive about using interactive games due to a lack of professional development opportunities, insufficient pedagogical knowledge, and concerns about their competence in game-based learning, which can hinder effective implementation in the classroom. (Andreoletti et al., 2024). Another challenge is the limited generalizability of skills acquired through games, and access to appropriate technology and infrastructure is another potential drawback (Alotaibi, M. S. 2024). In addition to teachers' challenges, students may struggle with the gameplay or find it unengaging. In contrast, others may become overly focused on winning and neglect the educational aspect of the game. (Hidayat et al., 2023).

This study explores how teachers and pre-service teachers perceive challenges in developing learners' literacy skills. How can the interactive games be appropriately designed and developed based on the data gathered from the interview? How can interactive games be evaluated in terms of content, format, presentation, organization, accuracy, and up-to-dateness of information? How can teachers evaluate the acceptability and usability of interactive games? Although many studies have shown a positive connection between play and learning, many are hesitant. By addressing these concerns, this study aims to provide valuable insights for educators, policymakers, and future researchers, ensuring that interactive games are effective for fostering literacy development among young learners.

METHODOLOGY

This study employed a mixed-methods research design, combining qualitative and quantitative approaches to understand how interactive games can support literacy development in early childhood education. It followed an exploratory sequential design, where the research began with collecting qualitative data through interviews and focus group discussions (FGDs). These initial insights informed the development of quantitative evaluation tools, ensuring the instruments were grounded in real classroom experiences and challenges. According to the study of Jafer et al. (2021), this technique, starting with qualitative data collection, helps tailor the subsequent quantitative phase to better reflect the needs and realities discovered early in the research.

The research took on a descriptive and developmental approach. It aimed to understand teachers' challenges when introducing literacy skills to young learners while creating and evaluating a hands-on educational tool: the Little Bright Box. By integrating direct classroom perspectives with structured data collection, the study provided a rich understanding of how educational games can be used effectively. Participants were purposefully selected based on their experience and involvement in early childhood education. During the qualitative phase, five kindergarten teachers and thirty-five pre- service teachers (BECED-4A students) participated by sharing their insights through interviews and FGDs. These educators provided valuable perspectives on teaching practices, learner engagement, and using games as educational tools. In the quantitative phase, four kindergarten teachers and two Learning Resource Management System (LRMS) coordinators were involved in evaluating the games in terms of content quality and usability.

Various instruments were used to collect data in each phase. In the qualitative stage, a semi-structured interview guide was used during one-on-one sessions with kindergarten teachers to explore their challenges in teaching literacy and their views on using interactive games. Meanwhile, FGDs with pre-service teachers were guided by a discussion outline to gather their collective observations and suggestions on game- based learning. For the quantitative stage, the LRMS Evaluation Rating Sheet for Print Resources assessed the games' content accuracy, formatting, presentation, and overall quality. Additionally, a researcher-made acceptability and usability questionnaire, utilizing a 4-point Likert scale, was used to gather feedback from teachers regarding the practicality and impact of the Little Bright Box.

Ethical protocols were carefully observed throughout the research process. All participants provided informed consent, and their confidentiality was protected by the Data Privacy Act of 2012 (RA 10173). During the qualitative phase, interviews and FGDs were conducted in person, recorded with permission, and transcribed for analysis. In the quantitative phase, the Little Bright Box was piloted in selected schools, and evaluations

were carried out using the standardized rubrics and questionnaires developed during the study.

Qualitative data were analyzed using inductive thematic analysis with the help of *NVIVO* software. Responses were grouped into recurring categories such as student engagement, instructional challenges, and feedback on the game features. These themes helped refine the game design and the structure of the quantitative instruments. Quantitative data were examined through descriptive statistics, including mean and standard deviation calculations, to summarize and interpret the results. The Likert scale responses were categorized as follows: 1.00–1.49 (Not Satisfactory), 1.50–2.49 (Poor), 2.50–3.49 (Satisfactory), and 3.50–4.00 (Very Satisfactory).

The findings from the qualitative phase directly informed the design and development of the Little Bright Box. Based on these insights, six interactive games were created, each focused on building specific early literacy skills such as letter recognition, phonemic awareness, and beginning writing. Experts in early childhood education then reviewed these games to ensure they were age-appropriate, safe, and educationally valuable.

Following expert validation, the games were implemented in actual classroom settings to gather feedback from educators on their usability and effectiveness.

Ethical considerations remained central throughout the study. Participants were fully briefed on the study's objectives and assured of their right to withdraw at any point. Data confidentiality was upheld, and the information collected was used solely for academic and developmental purposes. Overall, the methodology supported a collaborative, ethical, and evidence-based evaluation of interactive games as tools for enhancing literacy in early learning environments.

RESULT AND DISCUSSION

This study discusses the enhancement of interactive games as a tool for boosting and improving literacy skills in early childhood. The study's findings support the idea that play-based learning is important for young children's development; it focuses on how interactive games create meaningful, engaging, and developmentally appropriate experiences that support foundational literacy skills such as reading and writing. The result of this study supports the idea that children are more motivated and better able to absorb literacy concepts, making it a powerful strategy in early education when learning is fun and interactive. In addition, the researchers used NVIVO as a coding process to illustrate thematic analysis; it describes and supports the themes of the study's results. After all the data from the interview, focus group discussion, evaluation of interactive games using the LRMS Evaluation Rating Sheet, and Acceptability and Usability survey/evaluation form were tabulated, computed, and analyzed, the following are the results:

Part I. Perception of teachers and pre-service teachers on the challenges in developing learners' literacy skills.

A deep understanding of pre-service teachers guided the development of the Little Bright Box, which was used in developing learners' literacy skills, influencing their teaching effectiveness and confidence. This study explores their perceptions through a focus group discussion (FGD), highlighting key difficulties such as learner-related issues, instructional challenges, and systemic constraints. The table below presents the FGD findings, summarizing the challenges faced by pre-service teachers and their suggested strategies for improving literacy instruction.

Table I Coding Process of The Pre-Service Teachers' Experience with Students Having Literacy Difficulties.

Respondents	Categories	Themes
P7, P8, P17, P20, P29	Phonemic Awareness	Theme 1. Tackling
	and Letter Recognition	Challenges on
	Difficulties.	Phonemic Awareness

		and Letter Recognition
		of Learners

Table I indicates that when asked about their experience with interactive games as a teaching tool, the respondents provided different answers divided into two perspectives. Wahyuni et al. (2023) state that educational games create a dynamic learning environment that captivates students' attention, making learning enjoyable and less monotonous. (Agustina et. al. 2024) Also, game-based learning incorporates interactive elements that encourage active participation, leading to higher student involvement in the learning process Educational games give a transformative learning approach by enhancing learners' engagement, motivation, and the ability to retain knowledge. Interactive features, feedback, and motivational components are alternatives to traditional teaching methods (Phunsa & Pawala, 2024). It is suggested that interactive games are not just a tool but an integrative component of modern pedagogy, capable of enhancing knowledge and motivation.

Part II. Interactive games should be properly designed and developed based on the data gathered from the interview.

Interactive games should be appropriately designed and developed based on the data gathered from the interview. The study highlighted essential features of literacy-boosting games: engaging content that captures interest, interactive activities that encourage active participation, and age-appropriate language that matches the developmental stage of young learners. By combining the insights of kindergarten teachers with the principles of early childhood pedagogy, this study contributes to the knowledge of play-based learning. It offers practical implications for curriculum development and teacher training programs. This result emphasizes that interactive games can enhance children's reading and writing skills while making learning more enjoyable and meaningful.

Table Ii Coding Process of The Kindergarten Teachers' Considerations of Game Features Designed to Improve Literacy Skills.

Respondents	Categories	Themes
T1, T2, T3, T4, T5	Age-appropriate, adaptable, and engaging with clear learning objectives.	Theme 1. Designing Engaging and Adaptable Learning for All Ages

Table II: Interactive games must be appropriately designed to align with children's developmental levels to ensure they remain engaging, educational, and easy to navigate. According to the Age-Appropriate Design - Digital Thriving Playbook (2025), age-appropriate design enhances children's engagement and learning outcomes by matching digital content with their cognitive, physical, and social-emotional development. According to the study of (Benton et al., 2021), it emphasizes the importance of adaptability in literacy games, enabling learners to progress at their own pace while sustaining motivation and individual learning paths. In addition, Liu (2020) highlighted clear and straightforward instructions that help children navigate games, ensure learners understand goals and mechanics, and enhance their learning experience.

With these principles, interactive games can provide effective and enjoyable learning experience to support literacy development and academic growth.

Part III. Evaluation of Interactive Games

The teachers hold the quality of the material of the Little Bright Box through the Learning Resource Management System (LRMS). Little Bright Box was evaluated by the LRMS coordinator using specific areas such as content, format, presentation, organization, accuracy, and up-to-date information. The study aims at the effectiveness of interactive games in supporting teaching and enhancing the learning literacy skills in early

childhood. Analyzing the strengths and needs for improvement provides insight into how Little Bright Box contributes to learners' engagement and comprehension while enhancing the game and its impact on the classroom.

Table Iii Summary of Evaluation of Little Bright Box

Indicators	Ave. Rating	Standard Deviation	Description
1. Content	4.00	0.00	Very Satisfactory
2. Format	3.83	0.24	Very Satisfactory
3. Presentation and Organization	3.80	0.28	Very Satisfactory
4. Accuracy and Up-to- dateness of Information	4.00	0.00	Very Satisfactory
Overall	**3.91**	**0.13**	**Very Satisfactory**

SD - standard deviation

Table III shows that content and accuracy have the highest ratings, achieving 4.00 with no variance, which means it was rated very satisfactory. The quality and appropriateness of instructional materials can influence learners' ability to understand and remember information, and they should be aligned with educational standards and curriculum objectives to ensure that learners are exposed to the appropriate level of content and skills at each stage of their education (Listani et al., 2023). Quality content is like a guiding light, illuminating the path of understanding, while quantity ensures sufficient substance to fuel the learning journey (Ahmed et al., 2024).

The format, presentation, and organization also received "Very Satisfactory" ratings (3.83) for format and (3.80) for presentation and organization, with little variability, which means generally good feedback with slight differences of opinion. It has an overall score of 3.13, which means satisfactory, indicating that there may be room for improvement in certain areas. Nevertheless, scoring consistently high in content and accuracy indicates a solid foundation quality, and the "Very Satisfactory" scores in several categories indicate a sound and commendable effort. According to Karngbeae and Kennedy (2022), the format of instructional materials is crucial for effective instructional planning, as they facilitates the deconstruction of the curriculum into interactive relationship, enhancing engagement and understanding between teachers and learners. Moreover, when presentations are tailored to what the audience cares about, people are likelier to stay engaged and even have fun. Adding playful or interactive elements can make the entire e experience more memorable and enjoyable (HeyLillian, 2024).

Part IV. Teachers may evaluate the interactive games using the Acceptability and Usability Form.

Teachers play an essential role in assessing the appropriateness of interactive games suitable for classroom use. Their insights help to ensure that these tools support the educational objective of early childhood education. It examines their evaluation based on the key factors such as accessibility, collaboration, ease of use, and adaptability to diverse learning needs. By analyzing the mean and standard deviation, this study provides a descriptive interpretation of how well these games support effective and inclusive learning experiences. This evaluation focused on the acceptability and usability of interactive games in classrooms.

Table Iv Teachers Evaluated the Interactive Games in Terms of Acceptability

Indicators	Mean	SD	Description
1. The product is easy to understand and use without additional help.	3.25	0.50	Acceptable
2. The game offers opportunities for collaboration or teamwork.	4.00	0.00	Highly Acceptable

3. The product is simplified and is made more efficient for pupils.	3.75	0.50	Highly Acceptable
4. The resources available from the product are localized and are accessible.	3.00	0.82	Acceptable
5. The products are tailored to meet the learner's needs.	3.75	0.50	Highly Acceptable
6. The game accommodates players of different skill levels or experiences.	4.00	0.00	Highly Acceptable
7. The physical design of the game (size, weight, texture) is suitable for diverse players (e.g., those with motor difficulties).	3.50	1.00	Highly Acceptable
8. The game instructions are available in a format that is easy to read and understand (e.g., large print, simple language).	3.75	0.50	Highly Acceptable
9. The game integrates well with other classroom activities.	4.00	0.00	Highly Acceptable
10. How satisfied are you with the overall experience of using the product.	3.75	0.50	Highly Acceptable
Overall	**3.68**	**0.39**	**Highly Acceptable**

SD- Standard Deviation

Table IV shows the evaluation of the product, which demonstrates a high level of acceptability across various aspects. One of the strongest aspects of the product is its ability to encourage collaboration and teamwork, accommodate players of different skill levels, and integrate the game with other classroom activities, scoring a perfect mean (4.00), which is described as highly acceptable. Furthermore, the product's physical design receives a highly acceptable rating, with a mean score of 3.50 and a standard deviation 1.00. The clarity and simplicity of the game instruction, alignment with learners' needs, efficiency, and overall user experience performance, with a mean of 3.75 and a standard deviation of 0.50. It ensures the product is accessible and easy to understand for young learners. While the game's physical design maintains a solid rating, the response variation (SD=1.00) reflects differing opinions. The lowest mean score is 3.00, which pertains to the localization and accessibility of resources, categorized as acceptable, suggesting that improving resource availability may enhance overall user satisfaction. Similarly, the product's ease of use without additional help had a mean of (3.25), indicating room for improvement in simplifying usage. The overall mean score of 3.68 with a standard deviation of

0.39 indicates that the product was highly acceptable and positively perceived by teachers. One significant influence of play on children's social development. (Barblett and Knaus, 2019) concentrated on how cooperative play teaches children important social skills, such as compassion, collaboration, and conflict resolution, while enabling them to participate in meaningful interactions.

Table V Teachers Evaluated the Interactive Games in Terms of Usability

Indicators	Mean	SD	Description
1. The game can be easily set up and prepared for use.	3.75	0.50	Very Satisfactory
2. The game encourages problem-solving and critical thinking skills.	3.75	0.50	Very Satisfactory
3. The game works well in both individual and group settings.	3.75	0.50	Very Satisfactory
4. The materials used in the game are visually	4.00	0.00	Very Satisfactory

appealing and colorful.			
5. The game allows children to experiment and learn at their own pace.	4.00	0.00	Very Satisfactory
6. Teachers find the game time-efficient to include in their daily schedule.	3.75	0.50	Very Satisfactory
7. The game includes a variety of tasks or activities to maintain interest.	3.75	0.50	Very Satisfactory
8. The game encourages self-correction, allowing children to identify and fix their mistakes.	4.00	0.00	Very Satisfactory
9. The design of the game reduces the likelihood of accidents or injuries.	4.00	0.00	Very Satisfactory
10. The game is durable enough for long- term and regular use.	4.00	0.00	Very Satisfactory
Overall	**3.88**	**0.25**	**Very Satisfactory**

SD- Standard Deviation

Table V presents the result of the usability evaluation, which shows that kindergarten teachers have a very positive perception of interactive games utilized in their classrooms. The overall mean score was 3.88 with a standard deviation of

0.25. It indicates that the games are both practical and well- received as tools for early childhood education. One of the strongest aspects of the games was their visual appeal, safety, durability, and ability to encourage self-correction, all of which received a perfect score of 4.00 (SD = 0.00). It suggests that teachers believe games are interesting, safe, and long-lasting.

Additionally, teachers appreciated the children's ability to recognize and fix errors independently, encouraging learning independence (National Association for the Education of Young Children, 2019).

Additionally, teachers gave the games positive ratings in specific areas, such as critical thinking, adaptability to classroom settings, and time efficiency, although these aspects received slightly lower scores (M = 3.75, SD = 0.50). This suggests that while games are beneficial, there are still challenges to include in ensuring the games fit diverse classroom settings and managing time effectively for both pre-class preparation and in-class activities (Algayres et al., 2019).

Nuryati et al. (2024) found that non-digital activities, such as storytelling, group learning, and play-based techniques, are efficient. The games provide an engaging and effective approach for young learners to build essential skills within a safe and stimulating environment. Minor enhancements, such as simplifying the setup or increasing the variety of activities, could further improve the usability of the programs for educators and learners.

CONCLUSION

This study examined the effect of the Little Bright Box, an interactive learning tool aimed at boosting the literacy skills of early childhood learners. The findings from this study show that the Little Bright Box helped children improve their literacy skills. Learners who used the interactive games showed observable progress in recognizing letters and letter sounds, learning how to write letters, and reading. The data highlighted that students were more engaged and motivated than those using traditional learning methods; it proves that interactive play-based learning has a positive learning experience. Teachers and pre-service teachers observed the learners' active participation in learning activities. The use of Little Bright Box not only made learning fun but also helped learners to gain new information. These results emphasize the effectiveness of game-based strategies in early childhood education. This study recommended prioritizing and having time to develop

interactive games or materials that would help the learners develop their academic skills; when developing interactive games, they must consider using child-friendly and non-toxic materials to maintain safety standards and the localization of every material. Schools and early childhood educators should consider incorporating interactive games like Little Bright Box into teaching literacy to enhance learners' literacy skills. For future researchers, this study recommends continuing to develop different interactive games or materials for literacy and other subjects to help learners develop their academic performance.

ACKNOWLEDGMENT

The researchers would like to acknowledge the professors, participants, classmates, and our families for their unwavering guidance and support from the beginning until we were able to defend our research paper. We extend our heartfelt appreciation to all who contributed their time, effort, and encouragement, making this study possible. To our Research adviser, Dr. Joseline M. Santos, for her guidance and support to make this study possible. To the school principals of City of Malolos Integrated School-Catmon and City of Malolos Integrated School-Atlag, as warmly welcomed us to conduct our study. We sincerely thank our adviser Mr. Joel B. Faustino, and to our critic, Ms. Esther G. Domingo, for their valuable guidance and support to enhance the quality of our research paper. To all the college professors who validated our research and helped us to develop the materials. Their leadership and dedication have been a constant source of inspiration to us. We also like to express our deepest gratitude to our sponsors, who contributed to the completion of our study. Their assistance provided us with necessary resources to complete our work effectively. And lastly, to our Lord, Almighty God, for granting us strength, knowledge, and wisdom throughout our research journey. To God be all the glory!

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